

A New Variety of the Mycoheterotrophic Orchid *Didymoplexis obreniformis* (Orchidaceae) from Borneo, Malaysia

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A new variety, *Didymoplexis obreniformis* J.J. Sm. var. *maliauensis* Suetsugu, M. Suleiman & Tsukaya (Orchidaceae), found during a botanical expedition in the Maliau Basin Conservation Area, is described and illustrated. Variety *maliauensis* resembles var. *obreniformis*, which is known only from Java, Indonesia, in having a remarkably retuse lip but differs in having a distinct central ridge on the sepals and petals, smaller and narrower lip, narrower lateral petals, and narrower dorsal and lateral sepals.

Key words: Borneo, *Didymoplexis obreniformis*, mycoheterotroph, Orchidaceae, Sabah

Didymoplexis (Orchidaceae) comprises ca. 20 species of mycoheterotrophic orchids distributed throughout tropical Africa, Madagascar, Southeast Asia, India, the Pacific Islands, North Australia, and north to the Ryukyu Islands and Taiwan (Pridgeon *et al.* 2005, Hsu & Chung 2007). Similar to other mycoheterotrophic plants, species of *Didymoplexis* are small and emerge above ground only during reproduction. Consequently, they are often overlooked because of their small size and limited flowering season (Hsu & Chung 2007). An adequate taxonomic treatment has yet to be produced.

Recent botanical explorations in Borneo, one of the world's richest areas for mycoheterotrophic diversity, and for biodiversity in general, have revealed many previously undescribed mycoheterotrophic orchids (Tsukaya & Okada 2012, 2013, Tsukaya *et al.* 2011, 2014). Considering that many of these discoveries resulted from a limited number of surveys within only a few study sites, it is extremely likely that additional surveys will re-

veal the true diversity and distribution of mycoheterotrophic plants in Borneo.

Four species of *Didymoplexis* (*D. latilabris*, *D. pallens*, *D. striata*, and *D. cornuta* var. *betungkerihunensis* and var. *maliauensis*) have been discovered in Borneo. During a botanical expedition in the Maliau Basin Conservation Area, an area that contains some of the last intact rainforests in Southeast Asia, we collected plants that resembled *D. obreniformis* in that they possessed a remarkably retuse lip, but *Didymoplexis obreniformis*, which was thought to be endemic to Java (Comber 1990), has not been reported for Borneo. The plants, however also possessed some unique morphological characters, such as a distinct central ridge on the sepals and petals, smaller and narrower lip, narrower lateral petals, and narrower dorsal and lateral sepals than *D. obreniformis* as reported by Smith (1914) and Comber (1990). Considering the small but obvious differences in the morphology and disjunct distribution of our newly collected specimens, we describe these

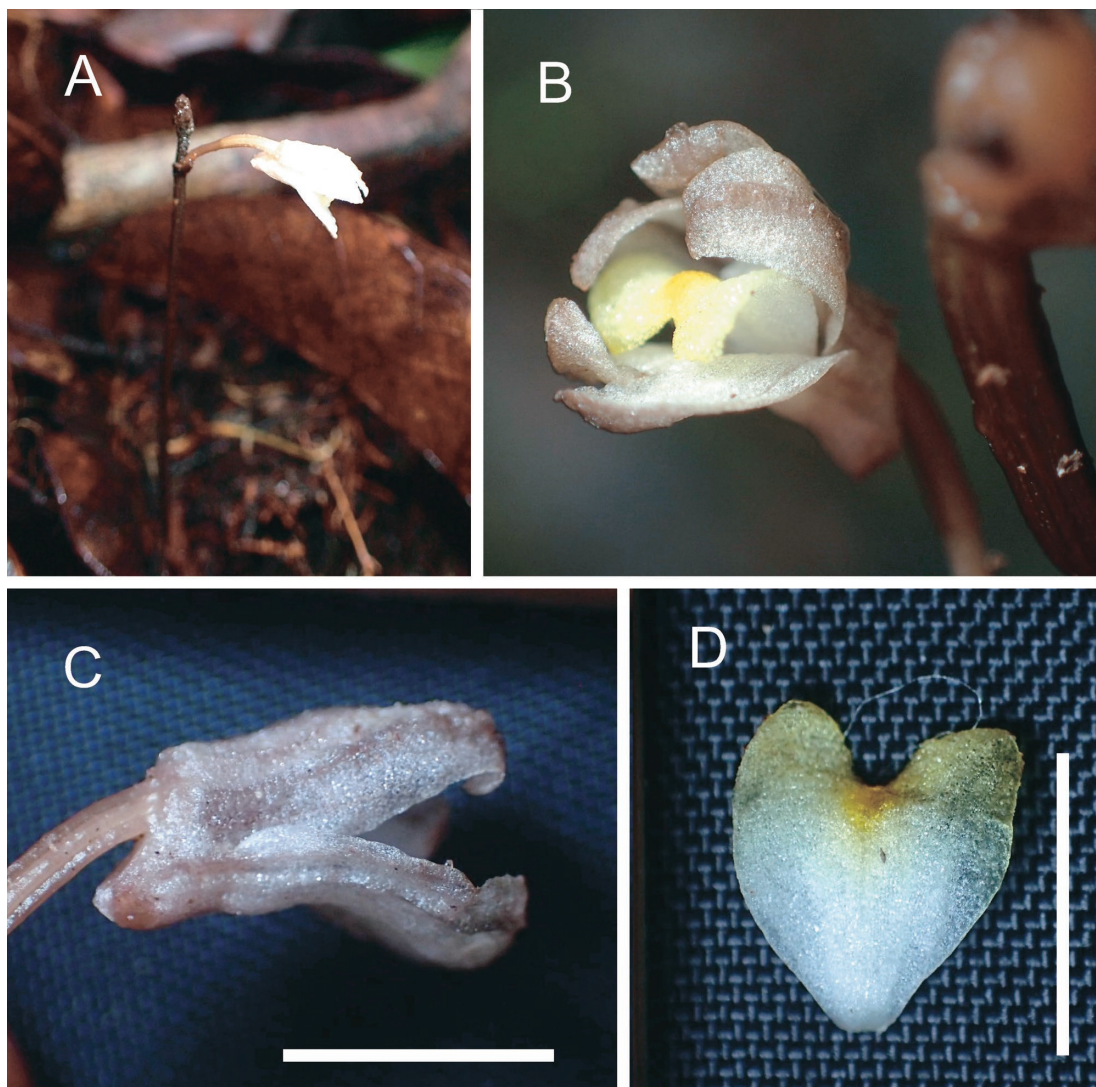


FIG. 1. *Didymoplexis obreniformis* var. *maliauensis* in the Maliau Basin Conservation Area, Borneo, Malaysia. A. Flowering plant. B & C. Flower. D. Lip. Bar = 1 mm.

plants as a new variety of *D. obreniformis*, namely, *D. obreniformis* var. *maliauensis*.

Taxonomic treatment

***Didymoplexis obreniformis* J.J. Sm. var. *maliauensis*.** Suetsugu, M. Suleiman & Tsukaya, **var. nov.** —Figs. 1, 2.

Typus. MALAYSIA. Sabah, Maliau Basin Conserva-

tion Area, around Nepenthes Camp (1020 m alt.), 28 September 2016. *H. Tsukaya, K. Suetsugu & M. Suleiman TSS-26* (holotype BORH, specimen preserved in 50% ethanol); MALAYSIA. Sabah, Maliau Basin Conservation Area, around Nepenthes Camp (965 m alt.), 29 September 2016. *H. Tsukaya, K. Suetsugu & M. Suleiman TSS-27* (paratype KYO, specimen preserved in 50% ethanol); MALAYSIA. Sabah, Maliau Basin Conservation Area, along the trail from Nepenthes Camp to Agathis Camp (860 m alt.), 30 September 2016. *H. Tsukaya, K. Suetsugu & M. Suleiman TSS-11* (paratype TI).

Diagnosis. *Didymoplexis obreniformis* var. *maliauensis* differs from *D. obreniformis* var. *obreniformis*, in

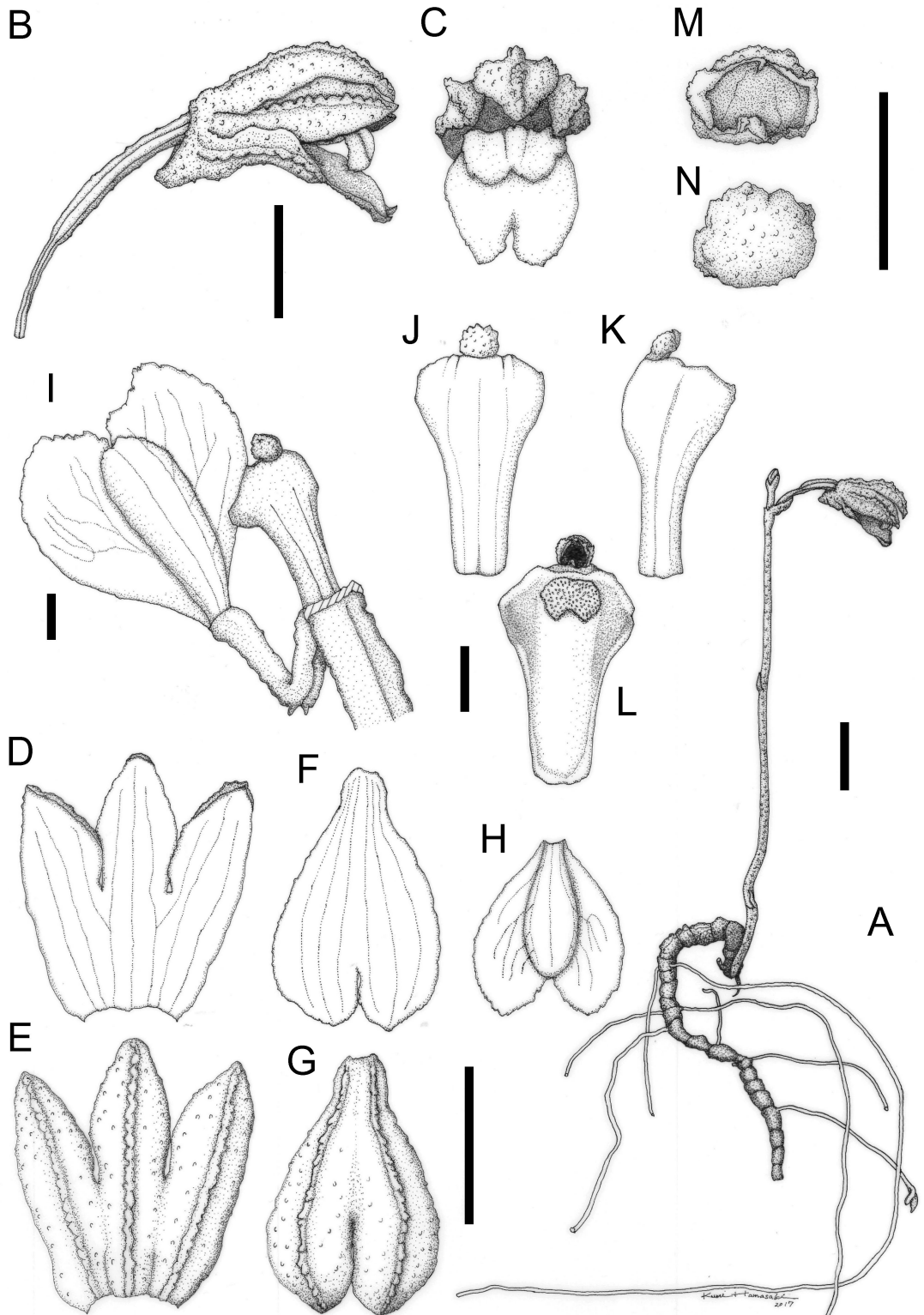


FIG. 2. *Didymoplexis obreniformis* var. *maliauensis* (from the holotype, H. Tsukaya *et al.*, BORH). A. Habit. B & C. Flower. D & E. Flattened connate dorsal sepal and lateral petals. F & G. Flattened connate lateral sepals. H. Lip. I. Lip with column. J–L. Column. M & N. Anther cap. A. Bar = 1 cm. B–H. Bar = 5 mm. I–N. Bar = 1 mm.

having a distinct central ridge on its sepals and lateral petals, a smaller and narrower lip, narrower lateral petals, and narrower dorsal and lateral sepals.

Herbs, terrestrial, mycoheterotrophic. Rhizome tuberous, fusiform or cylindrical, 2–4 cm long, 3–5 mm in diameter. Inflorescence erect, dark brown, glabrous, 6–9 cm long, 1.5 mm in diameter, with membranous sheaths. Bracts to 3×1.5 mm. Pedicel and ovary to 15 mm long, pale brown. Rachis 0.7–1.6 cm long, (1–)2–4 flowered, internodes 4–8 mm long. Flowers 8–9 mm long, 7 mm in diameter, slightly upwards or downwards, resupinate, opening slightly. Sepals and petals connate into a floral tube. Dorsal sepal ca. 8.1 mm long, connate with lateral petals for ca. $1/2$ to $2/3$ their length, outer surface pale pinkish brown, verrucose, with brown central ridge extending toward apex; free portion of dorsal sepal ca. 3.5×2.7 mm, ovate-triangular, margin entire, apex obtuse. Lateral petals ca. 7.5 mm long, connate with dorsal sepal for ca. $1/2$ to $2/3$ their length, outer surface pale pinkish brown, verrucose, with brown central ridge extending toward apex; free portion of lateral petal ca. 3.5×2.7 mm, ovate-triangular, apex obtuse or acute, margin entire. Lateral sepals ca. 8.1 mm long, connate for ca. $4/5$ their length, outer surface pale brown, verrucose, with dark brown central ridge extending toward apex; free portion of lateral sepal ca. 2×2.7 mm, shallowly ovate or ovate-triangular, apex obtuse, margin entire. Lip white, apex tinged yellow, deeply retuse, ca. 5.7×5.2 mm, margin erose. Column white, clavate, ca. 3.8 mm long, apex enlarged, with two inconspicuous rhombic wings. Anther cap white, hemispheric, ca. 0.7 mm in diameter, pollinia 2. Fruit capsule, cylindrical, 1.8 cm long; pedicel elongating to ca. 14 cm long in fruit. Seeds fusiform, ca. 1.5 mm long.

Taxonomic note. The most remarkable characteristic of *Didymoplexis obreniformis* var. *maliauensis* is shallowly erose margin of the retuse lip. In this regard, the plants are highly similar to *D. obreniformis* var. *obreniformis* (Smith 1914, Comber 1990). Variety *maliauensis* can be distin-

guished from var. *obreniformis* by the distinct central ridge on each sepal and petal (vs. three and two ridges on each sepal and petal, respectively), smaller and narrower lip (5.7×5.2 mm vs. 6.2×7.3 mm), narrower connate lateral sepals (8.1×5.4 mm vs. 7.6×7.4 mm), smaller and narrower free portion of the dorsal sepal (3.5×2.7 mm vs. 4×3.8 mm), and narrower free portion of the lateral petals (3.5×2.7 mm vs. 3.6×4 mm).

Habitat and ecology. Less than 10 individuals of *Didymoplexis obreniformis* var. *maliauensis* were found in three locations in the wet understorey of a kerangas forest in the Maliau Basin Conservation Area. This area is dominated by members of *Agathis* and the Dipterocarpaceae and accompanied by shrubs of *Rhododendron*. The locations where *D. obreniformis* var. *maliauensis* was collected were also rich in other mycoheterotrophic species, including an unknown member of the Thismiaceae, two members of the Burmanniaceae (*Gymnosiphon aphyllus* and *Burmannia lutescens*), and three species of orchids (*Lecanorchis betung-kerihunensis*, *Aphylorchis pallida*, and *Cystorchis saprophytica*).

Given that mycoheterotrophic plants are highly dependent on the activities of both the fungi and the trees that sustain them (e.g., Suetsugu *et al.* 2014), they are particularly sensitive to environmental disturbance. It has therefore been suggested that the species richness of these specialized plants is a useful indicator of the overall floral diversity of the forest (Merckx *et al.* 2013). Accordingly, we recommend that the area where these mycoheterotrophs occur should be carefully conserved.

Distribution. *Didymoplexis obreniformis* var. *maliauensis* is restricted to the Maliau Basin Conservation Area, Sabah, Borneo, Malaysia. *D. obreniformis* var. *obreniformis* is only known to occur in Java, Indonesia (Comber 1990). Even though the two varieties exhibit morphological differences, it is intriguing that *D. obreniformis* exhibits a disjunct distribution (Java and Borneo). Similar to other mycoheterotrophic plants, species of *Didymoplexis* are easily overlooked in the

wild owing to their short flowering season and dwarf habit. Considering that recent botanical surveys have documented several new species and new distribution records for *Didymoplexis* (e.g., Tsukaya & Okada 2012, Tsukaya *et al.* 2014), *D. obreniformis* may be distributed more widely than documented to date. Further exploration is needed to elucidate the distributions and morphological variations of *D. obreniformis*.

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